GEOLOGY

Physiographic Region

The majority of the Crooked River basin lies within the Western Glaciated Plains Natural Division with a small area near the mouth in the Big Rivers Upper Missouri Natural Division (Figure nd)(Thom and Wilson 1980). The entire basin is in the Dissected Till Plains and is near the southern edge of the area covered by glaciers (Detroy and Skelton 1983). The basin topography consists of rolling to hilly glacial plains with narrow ridges and steep side slopes. The Missouri River flood plain near the mouth of the Crooked River is extremely flat and poorly drained.

Geology and Soils

The basin is underlain by Pennsylvanian-aged formations consisting primarily of sandstone, shale, limestone and thin seams of coal (Figure ge)(Detroy and Skelton 1983). The bedrock slopes from the southwest to the northeast underneath the basin. Large areas of Bethany limestone are found in the western part of the basin (Preston 1986). The lower Crooked River basin is underlain by the Lexington coal field (MDNR 1986a).

Most basin soils are formed from glacial till (a mixture of clay, rock, gravel and sand), alluvium (water deposited soil) and a windblown silt called loess. The soils have their origin in the four periods of continental glaciation with deposits from the final glacial advance (Kansan) overlying earlier deposits. After glaciation a thick layer of loess was deposited over the basin creating a relatively level drift plain (USDA-SCS 1982). Weathering over several thousand years has produced dissected glacial till plains overlain by loessial soils. Loess deposits decrease in thickness from southwest to northeast across the basin. (Preston 1986). Loess deposits range from 32 feet deep near the Missouri River to about eight feet deep near the headwaters (MDNR 1995). Loessial soils cover broad, gently sloping ridges of silty loam and are suitable for farming. Glacial soil occurs on steeper, eroding slopes and it is a less productive brown loam or gritty silt loam. Glacial deposits overlie limestones and shales and are generally less than 100 feet thick (MDNR 1995). Valleys are covered with alluvial silt and clay loams, and are the most productive soils in the basin. Areas where surface soil has been eroded and subsoil has been exposed are less productive (USDA-SCS 1982).

Watershed Area

The Crooked River is a sixth order river with a basin area of 335 square miles (214,790 acres; USDA-SCS 1982). The Crooked River basin is bordered by the Fishing River basin to the west, the Wakenda River basin and Moss Creek to the east (all minor Missouri River tributaries) and the Grand River basin to the north. The basin has a maximum width of about 20 miles. The flood plain width varies from 500 feet in the upper reaches to about one mile in lower sections of the basin (NRCS field exam report). The Crooked River mainstem is about 70 miles in length and runs from northwest to southeast.

Channel Gradient

Channel gradients for most of the Crooked River watershed were reported to range from 5 to 50 feet per mile in 1976. The gradients found in the Missouri River bottom area were about 1/2 foot per mile (NRCS field exam report). Based on current topographical maps, average gradients in the Crooked River basin range from 5 to 138 feet per mile. Stream gradient information for fourth order and larger streams in the Crooked River basin can be found in Appendix A.

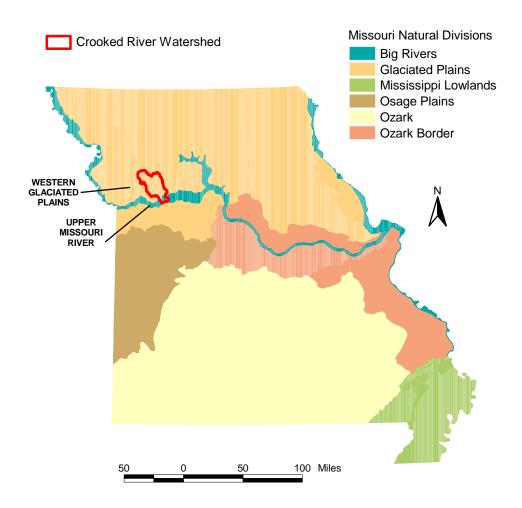


Figure nd. Location of the Crooked River watershed in the natural divisions of Missouri.

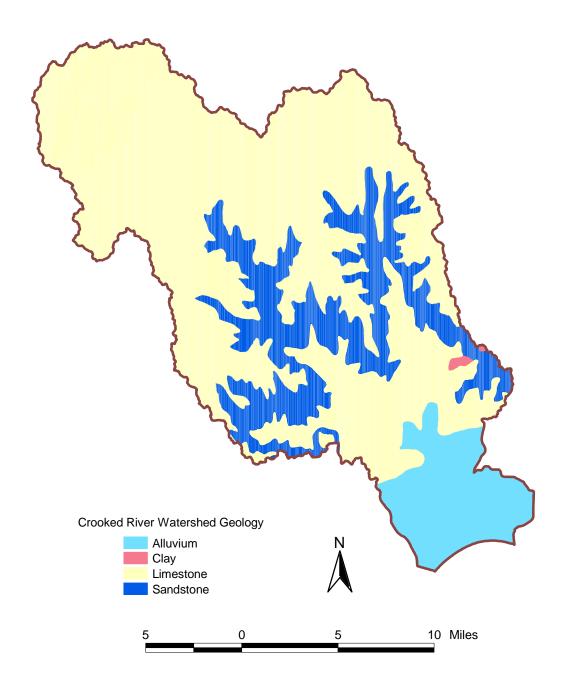
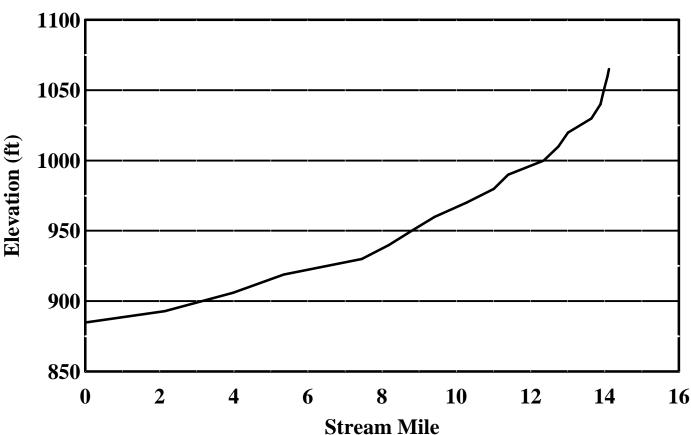


Figure ge. Geology in the Crooked River watershed.

Appendix A. Gradient plots of fourth order and larger streams within the Crooked River basin, digitized from 7.5 minute series, 1:24,000 scale, USGS topographic maps. Gradient plots are organized by stream proximity to mouth of the Crooked River.

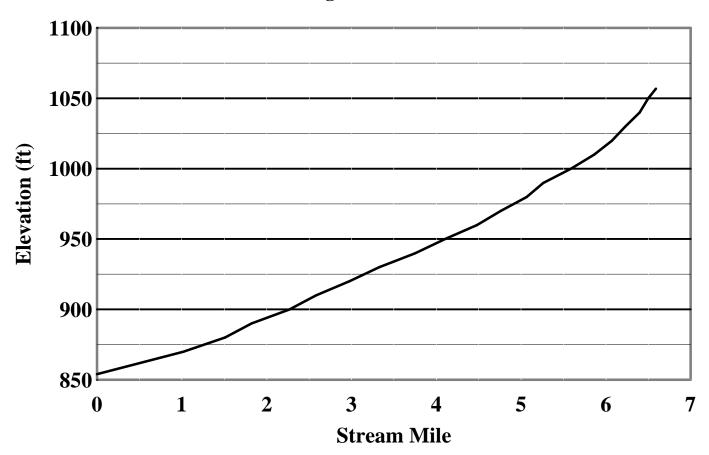
Appendix A. Gradient plot for Brushy Creek, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 29 and Section 33. The stream is located on 7.5 minute quadrangle maps Elmira and Lawson.





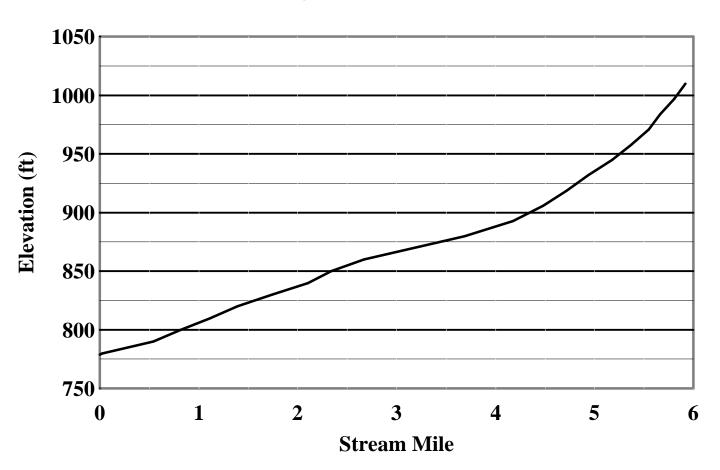
Appendix A. Gradient plot for Burnt Fork, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 54, Range 29 and Section 09. The stream is located on 7.5 minute quadrangle maps Elmira and Lawson.

Burnt ForkAverage Gradient: 30.8 ft/mi



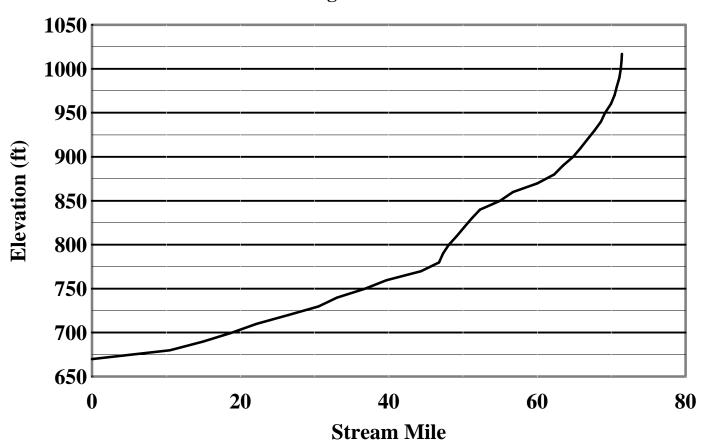
Appendix A. Gradient plot for Cockerel Creek, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 54, Range 28 and Section 19. The stream is located on 7.5 minute quadrangle maps Knoxville and Polo.

Cockerel Creek Average Gradient: 39.0 ft/mi



Appendix A. Gradient plot for Crooked River, the 6th order main channel in the Crooked River watershed. The location of the mouth is at Township 51, Range 26 and Section 14. The stream is located on 7.5 minute quadrangle maps Lexington, Hardin, Richmond, Rayville, Knoxville, Lawson, Elmira, and Lathrop.

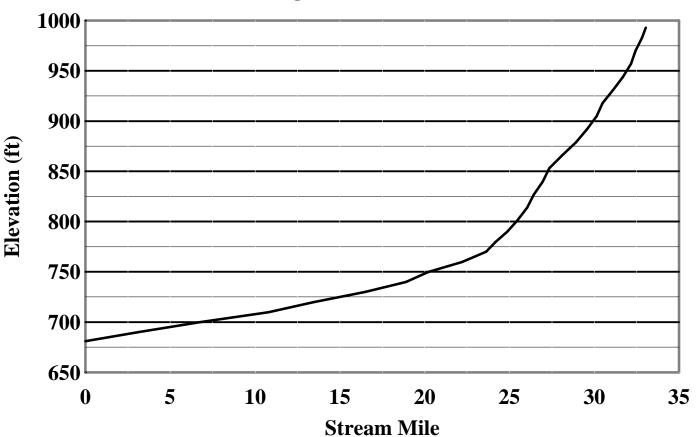
Crooked River Average Gradient: 4.9 ft/mi



Appendix A. Gradient plot for East Fork Crooked River, a 5th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 52, Range 27 and Section 23. The stream is located on 7.5 minute quadrangle maps Richmond, Millville, and Cowgill.

East Fork Crooked River

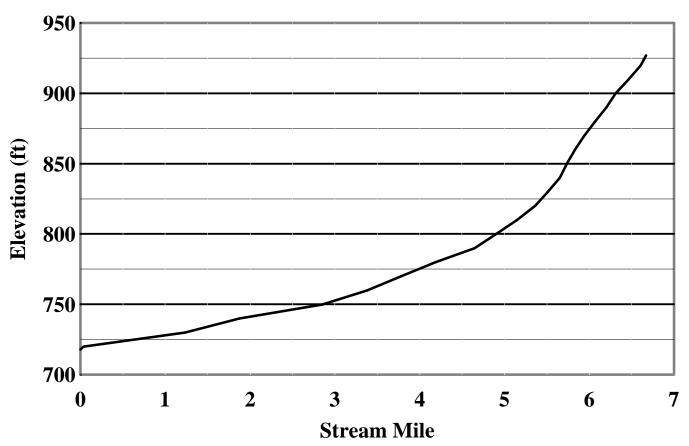
Average Gradient: 9.4 ft/mi



Appendix A. Gradient plot for McDonald Branch, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 53, Range 28 and Section 36. The stream is located on 7.5 minute quadrangle maps Richmond, Rayville, and Knoxville.

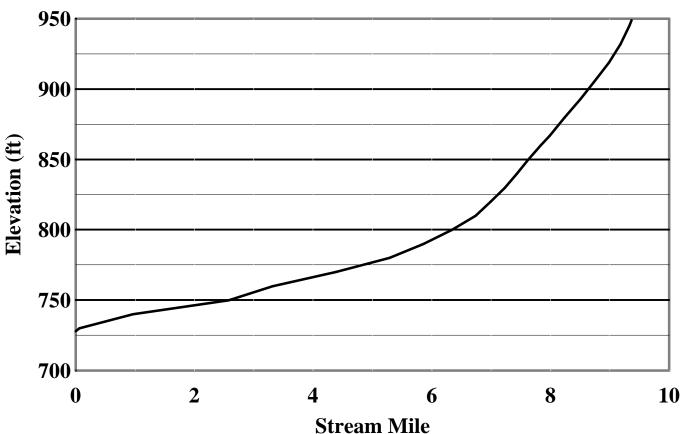
McDonald Branch

Average Gradient: 31.3 ft/mi



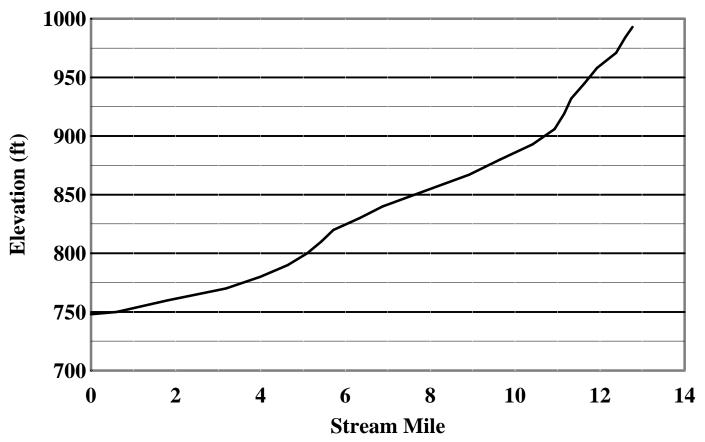
Appendix A. Gradient plot for Unnamed #05, a 4th order tributary of the East Fork Crooked River in the Crooked River watershed. The location of the mouth is at Township 53, Range 27 and Section 09. The stream is located on 7.5 minute quadrangle maps Millville and Cowgill.





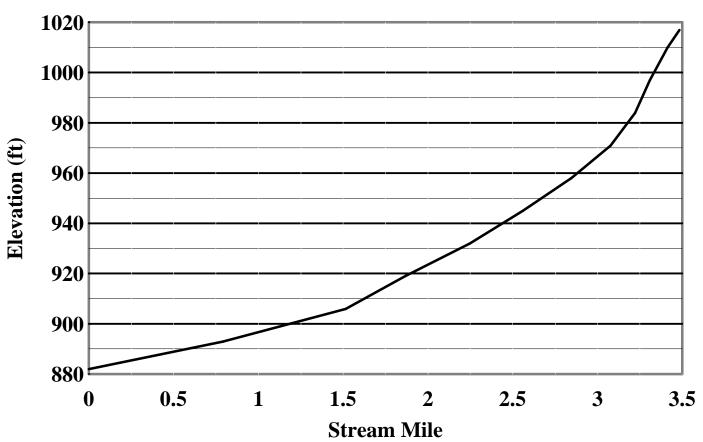
Appendix A. Gradient plot for Unnamed #08, a 4th order tributary of the East Fork Crooked River in the Crooked River watershed. The location of the mouth is at Township 54, Range 27 and Section 29. The stream is located on 7.5 minute quadrangle maps Millville, Knoxville, and Polo.





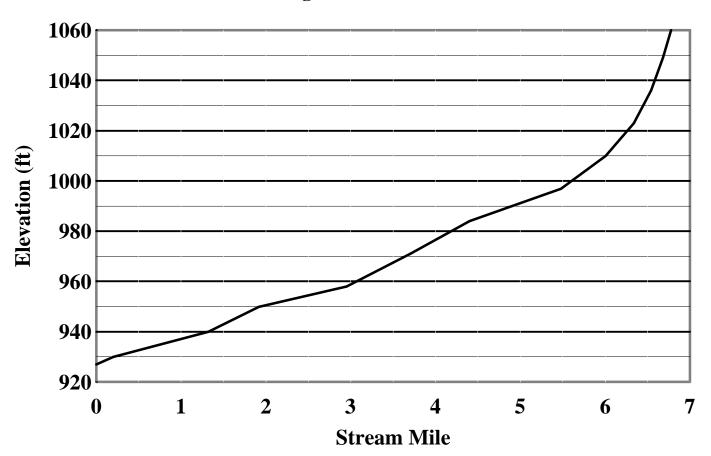
Appendix A. Gradient plot for Unnamed #28, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 29 and Section 33. The stream is located on 7.5 minute quadrangle map Elmira.



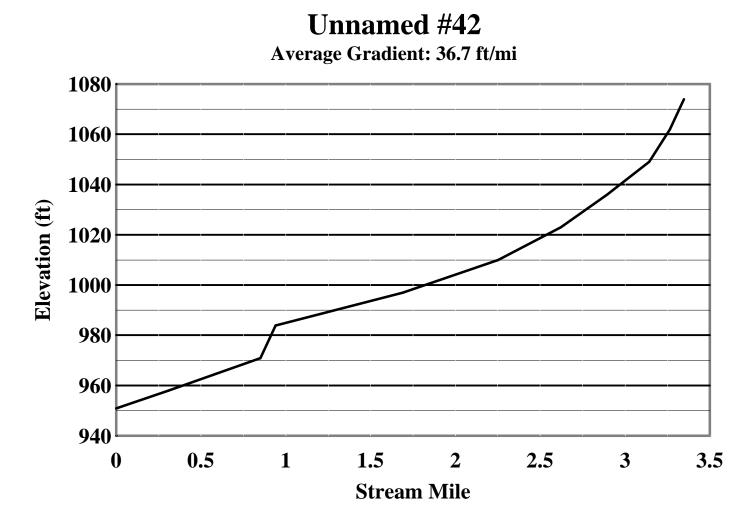


Appendix A. Gradient plot for Unnamed #32, a 4th order tributary of Brushy Creek in the Crooked River watershed. The location of the mouth is at Township 54, Range 29 and Section 18. The stream is located on 7.5 minute quadrangle maps Lawson, Elmira, and Lathrop.

Unnamed #32Average Gradient: 19.6 ft/mi

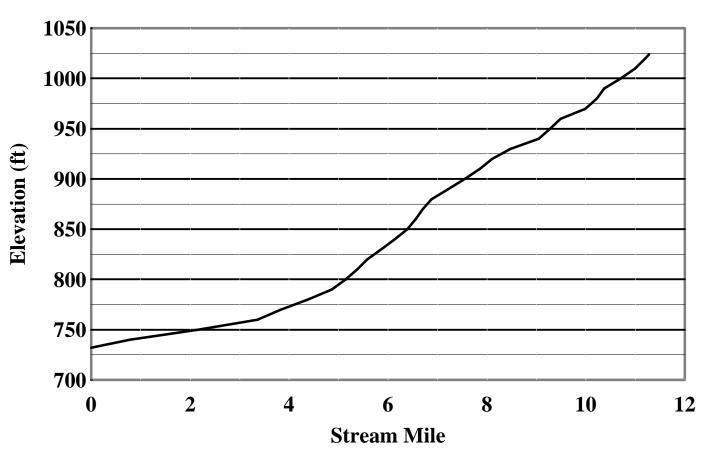


Appendix A. Gradient plot for Unnamed #42, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 30 and Section 35. The stream is located on 7.5 minute quadrangle maps Elmira and Lathrop.



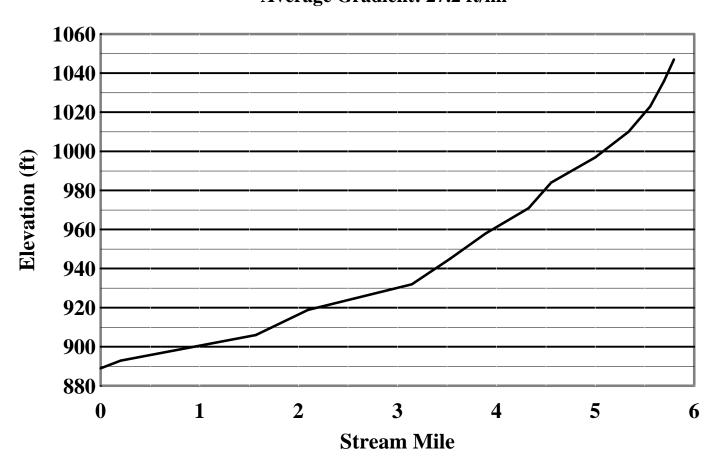
Appendix A. Gradient plot for Rocky Fork, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 53, Range 28 and Section 28. The stream is located on 7.5 minute quadrangle maps Rayville, Knoxville, and Lawson.

Rocky Fork Average Gradient: 25.9 ft/mi



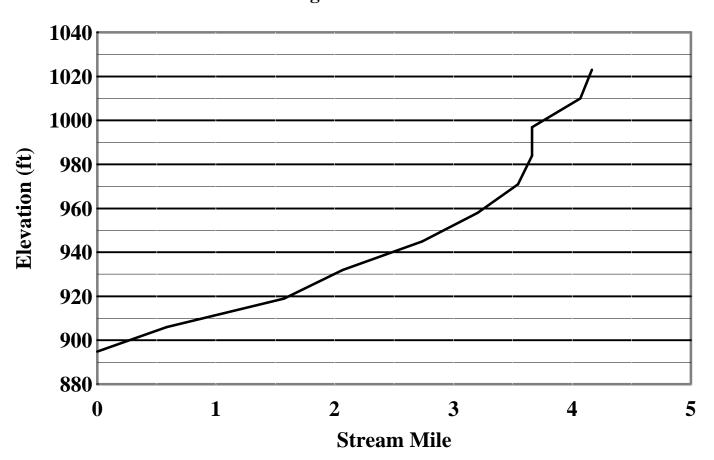
Appendix A. Gradient plot for South Prong, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 29 and Section 28. The stream is located on 7.5 minute quadrangle map Elmira.

South Prong Average Gradient: 27.2 ft/mi



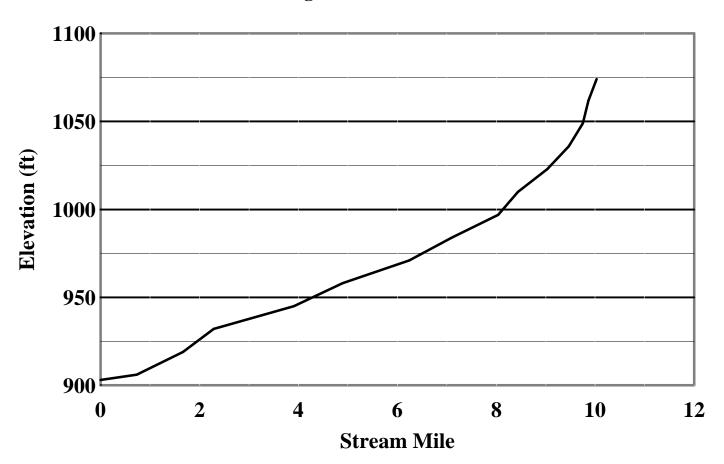
Appendix A. Gradient plot for Spring Branch, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 29 and Section 29. The stream is located on 7.5 minute quadrangle map Elmira.

Spring Branch Average Gradient: 30.7 ft/mi



Appendix A. Gradient plot for Stevenson Creek, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 55, Range 29 and Section 29. The stream is located on 7.5 minute quadrangle maps Elmira and Lathrop.

Stevenson Creek Average Gradient: 17.1 ft/mi



Appendix A. Gradient plot for West Fork Crooked River, a 4th order tributary of the Crooked River in the Crooked River watershed. The location of the mouth is at Township 52, Range 27 and Section 27. The stream is located on 7.5 minute quadrangle maps Richmond, Rayville, and Excelsior.

West Fork Crooked River

Average Gradient: 16.8 ft/mi

